

## Development of e-learning as a medium of simulation learning and digital communication for vocational school students

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**Abstracts.** The teaching process is a communication process between teachers and students, as well as a student with other students. Thus, materials or information delivered by the teachers should be well-accepted by the students and received the right feedbacks. But, when digital simulation and communication teaching process was conducted, there were some problems. The problems were time, space/distance, media, limited learning resources which were not able to fulfill the needs of the teaching processes, and also the psychological barriers within the students' selves. From those problems, an e-learning teaching media was developed based on the needs, characteristics, and styles of the students as Z generation nowadays. The development of this e-learning media applied steps from Lee Owens model, which are analysis, design, development, implementation, and evaluation. The result of the event then was validated by the material experts, media experts, and the students. The overall result showed the media was valid and suitable to use as an alternative for getting the learning resources. The result of the competency test toward students on average achieved 81.7%, which showed that there was an increase in learning outcome using e-learning, and it reached the minimum criteria of completeness.

**Keywords:** e-learning, online learning media

### Introduction

The development of digital computing technology greatly influences the learning style of students as a modern generation of Z. Their daily activities cannot be separated from the use of internet-based media. Starting from finding information about hobbies, news, chat to reference studies. Dependence on cyberspace can occur outside or inside the school environment, so students are required to be smart in filtering the information they get.

Seeing the habits of students in utilizing internet technology, it is time to create innovation through the development of learning media that are tailored to the characteristics and needs of students. Learning media is one of the essential components that influence the learning process. Without the media, communication in a learning system cannot take place optimally. Media is used as a means to facilitate teachers in delivering learning messages effectively and efficiently [1].

The research findings in the implementation of simulation and digital communication learning at the vocational high school level are still experiencing several obstacles related to time, space, media, learning resources, and psychological barriers in students [2]. Ideally, this subject matter, the theory that must be conveyed is 30% and practice as much as 70%. But, in reality, it cannot be fully implemented according to the learning plan.

The limited time provided by the school makes it difficult for teachers to develop material and carry out learning objectives to the fullest. Face-to-face meetings occur only once a week, with a duration of 135 minutes. So that learning occurs only if the teacher and students meet directly in a class situation. Ideally, education should have been designed to be carried out without the limitations of time and distance.

The acquisition of learning outcomes of many students who have not reached a minimum standard of completeness. The low

purchase of learning outcomes is due to limited learning resources; teachers lack training in the form of competency tests to train their abilities cognitively and psychometrically, so students are used to being less active in learning.

Learning strategies that are used have not varied so that they can lead to boredom in the class. Learning that should be student-centered is, in fact, still teacher-centered. Students lack the self-confidence to express their opinions and thoughts, one of which is caused by a factor of shame and fear that their ideas or answers are wrong.

Based on the problems described above, the learning carried out has not been conducive. Addressing this problem needs to be developed as an alternative solution in the form of developing learning media tailored to the needs and characteristics of students in the form of e-learning based media aimed at minimizing the difficulties of students and teachers in teaching and learning activities mainly due to psychological, geographical and time problems.

Seeing the development of information and communication technology and the learning behavior of the digital era is also the main reason for the development of e-learning based learning media. Learning behavior in the digital generation today requires learning media that match their characteristics. According to [3], there is an interaction between the use of instructional media and students that can stimulate learning activities; therefore, without media, learning will never happen.

The development of e-learning can condition students to learn independently. Students can access online from various libraries, museums, databases and get primary sources on various historical events, biographies, recordings, reports, and statistics [4].

The selection of the development of online-based learning media considers its ability to store, process, and provide infinite information, does not require significant production costs compared to the cost of procuring printed textbooks, web-based teaching materials can easily be updated at any time according to learning needs [5].

Media development is a wise step to improve the learning process about learning delivery strategies that have not been effective,

efficient, and do not have the attraction to keep students learning. Development of this media has a central function as a complement / complementary face-to-face learning [6]. E-learning was developed using the moodle opensource platform that has been specifically designed as a learning management system, so it is very suitable for creating an online learning environment [7].

#### E-Learning

E-learning is a form of teaching and learning using the internet, intranet, or other computer networks to deliver teaching materials to students [8].

The e-learning system was first introduced by Illinois universities at Urbana Champaign using a computer-assisted instruction system and a computer called PLATO.

According to [9], e-learning can be grouped into two main groups, namely network-based e-learning (including online learning and web-based learning) and e-learning that does not use networks (computer-based learning).

E-learning has components that support learning activities in the form of (a) teaching material material; the material is provided in the form of modules equipped with questions as a measure of the success of students and equipped with results and discussion, (b) community; students can develop online communication with the learning community, (c), online learners; teachers are always online to give direction to students, answer questions and help in class discussions, (d) opportunities to work together; the existence of software that organizes online meetings so that the learning process can be carried out simultaneously or real-time without distance constraints, (e) multimedia; the use of audio-video technology in the delivery of material so that it attracts interest in learning [10].

There are several advantages of e-learning compared to conventional learning models [4], namely: (a) learners can learn more flexibly according to their time, (b) the freedom to choose their facilities, place and learning environment that are considered conducive to study, (c) students do not experience significant psychological barriers. They are more daring to do online training, not feeling afraid, embarrassed even when experiencing errors, (d)

online material is easily rejuvenated at any time, this is different from teaching materials arranged in printed book form which if renewed must reprint the book, (e) with e-learning can familiarize the use of ICT and train the soft skills needed by students.

#### **Learning Management System (LMS)**

Learning management system is software that is a platform for online learning based on a website with features that support learning such as learning material, discussion space, task collection, and evaluation.

For the benefit of developing e-learning based learning media, researchers chose an open source learning management system (LMS) because open source software can be downloaded and used for free, to run this system does not require expensive software, schools can use LMS without time limits, operation does not require mastery of a complicated programming language because its features have been built quite complete

#### **Moodle**

Moodle stands for Modular Object-Oriented Dynamic Learning Environment. Moodle is one of the learning management systems that are useful for building online classes or courses that can be attended by students around the world. Moodle has capabilities including forums, journals, quizzes, and sections to display assignments. The teacher has full user access in controlling his learning system, knowing the tasks of students when uploaded on servers, making classroom management in cyberspace user-friendly.

#### **Online Learning Strategy**

Effective online learning depends on the true learning experience that has been designed and facilitated by educators/teachers who have teaching skills. Students have different learning styles; teachers as online learning controllers must design learning activities that are by the patterns that learners create to provide a significant experience. In developing online learning, this can be improved by utilizing several types of learning strategies. Existing learning strategies that apply to traditional environments, and when designing programs for online learning environments, this strategy must be adapted to the new environment.

Traditionally, in the teacher-centered classroom, the one who controls the environment is the teacher because the teacher has a monopoly of information. In online learning, the existence of fast access to data and information to user resources, students are no longer entirely dependent on knowledge in traditional classes. I am starting teaching online, making learning activities more collaborative, contextual, and active. The teacher must first design the curriculum, objectives, and then consider how the best online environment can serve the learning and activity objectives contained in the curriculum. The teacher takes on the role of an information facilitator and is tasked with guiding students towards solutions to their learning problems.

For the online learning process to be successful, teachers and students must take on a new role in the teaching and learning relationship, and the school must be willing to give up control of learning to students. The online learning environment allows a variety of interactive methodologies, and teachers have found that in adapting to programs for online models, what is more attention is the design of learning, so that the quality, quantity and communication patterns of students who practice during education can be improved.

The teacher must choose the most effective learning strategy to achieve learning goals. Learning strategies applied in online classes can be in the form of contract learning strategies, online lectures, discussions, self-directed learning, mentorship, small group work, projects, collaborative learning, case studies, forums, and games.

However, from some of these learning strategies, there is no single strategy that is best suited to apply to all forms of online learning. So, the determination has gone through the steps of analyzing the situation and characteristics of students

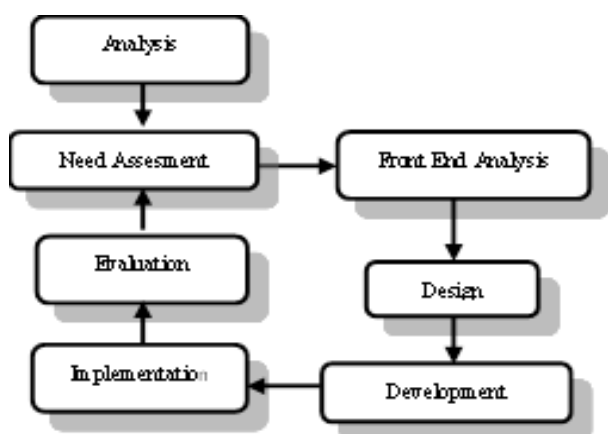
#### **Research Methods**

The research and development method used is referring to the steps to develop e-learning based learning media, namely the stages of development of Lee & Owens. This development model is multimedia-based, which is very suitable to be applied in the development of computer-based training, web-

based training, distance broadcast training, and performance-based solutions.

Each stage described in Lee & Owens's design model is carried out in detail according to the procedures specified to produce the right product according to expectations and goals. The expected outcome is to provide learning media specifically designed for online learning activities (e-learning).

The steps of the model can be illustrated in Figure 1. In the early stages of developing the model, Lee & Owens followed the steps of analysis by Dick and Carey (1990), which separated the analysis phase into two parts: needs assessment and front-end analysis followed by design, development, implementation, evaluation and return to needs assessment.



**Figure 1.** Development Model of Lee & Owens [11].

In the stage of needs analysis, scientific activities are carried out that involve various techniques of collecting data from multiple sources of information to find out the gap (gap) between the conditions that should occur (ideal) and the actual situation that has happened (reality).

The stages of front-end analysis are used to bridge the gap that exists between reality and hope for resolving identified problems. Front-end analysis consists of 10 steps, which include: audience analysis, technology analysis, task analysis, technical incident analysis, issue analysis, objective analysis, media analysis, existing data analysis, cost analysis. But in practice, only a few stages of the front are carried out. -end analysis of adjusted development requirements.

The stages in audience analysis are identifying students ranging from social background, age, ethnicity, entry behavior, learning environment, interest, and motivation whose data is obtained through interview techniques and questionnaires. The audience in this study were students of class X of SMK N Tutor Pasuruan who participated in simulation and digital communication subjects. They come from several Madurese and Javanese tribes with an average age of 15 years. Percentage of students is at the high/middle to upper economic level as much as 23.07%, medium economic level as much as 57.69% and middle to lower economy as much as 19.23%. This percentage is quite safe as a consideration for the development of online media, which will depend on an internet connection, students can use the wifi facilities for free or buy data packages.

At the design stage, the first step is to arrange a project schedule, namely the activities carried out starting from compiling the instrument for initial analysis, observing to SMK N Tutor Pasuruan, conducting needs analysis and frond end analysis, deciding the solution to the problem of producing e-learning based learning media, uploading learning and assignment material, registering teachers and students in Moodle LMS, introducing and simulating media usage, trials and revisions. Next make a team project, media specifications, lesson structure to configuration control.

After the design phase is complete, the next step is to carry out activities at the development stage starting from mapping the links in the flowchart, checking the design of web pages, conducting a review to the design conformity with technical standards, creating and assembling web pages in accordance with the design and web development standards for learning, doing technical review, debugging and testing web pages to see conformity with the designs that have been made up to the implementation of the media.

The final stage of this development is a formative evaluation to determine the quality/quality of the media that has been developed. Evaluation is done by providing assessment instruments in the form of questionnaires to material experts, learning media experts, and students. The results obtained as a consideration in revising product

development include media, strategies, and learning materials used in online classes.

## **Results and Discussion**

The results of the development in the form of LMS Moodle-based e-learning with school profiles, guidelines for the use of media for teachers and students, learning implementation plans, list of student identities, learning materials, assignments, competency test exercises, remedial questions, and enrichment questions.

This e-learning developed as a complement to conventional classroom learning activities. Teachers and students already have an account to log in to the e-learning portal. Online learning is done synchronously and asynchronously. Virtual synchronous is done with the teacher and students every three times a week with the agreed time; this activity is carried out through chatting in the online consultation feature. While asynchronous is flexible, students can freely study the material, do practice questions, discuss in forums whenever and wherever.

E-learning has gone through trial and revision stages from material experts, media experts, and students. The assessment of material experts by grade X teachers who taught simulation and digital communication subjects was conducted to provide feedback/input on the accuracy of the presentation of simulation and digital communication subject matter, learning objectives, evaluation, feedback, and alternative learning activities. The results obtained from the trial of material experts reached an average of 89.58%, which indicates that e-learning material in the criteria is valid and feasible to use.

While the trial of media experts criteria assessed included the appearance of the media, ease of access, compatibility with learning objectives, completeness of features. The percentage of trials obtained was 86.80%, based on the predetermined success criteria, the e-learning developed was included in the criteria valid and feasible to be used as learning media.

The results of the assessment and revision of the material experts and media experts as a consideration of the improvement of learning media whose results were then tested on all students of class X Multimedia majors totaling 36 people through the questionnaire instrument.

From the results of the large group trial, the average achievement of success was 81.72%. This percentage shows that e-learning learning media is valid and feasible to be used as an alternative to the group and independent learning resources.

The use of e-learning has never been done before by teachers and students so that developers work with the teacher to provide training in a complete way to use that is equipped with a guide or tutorial that is easy to run.

Students are very enthusiastic and ready to use e-learning as a complement to learning activities. Teachers can monitor activities in online classes and help their learning difficulties.

Assessment of learning activities is only carried out at the stage of formative evaluation which is adjusted to the recommendations of Lee & Owens that learning activities at the formative stage can be monitored every week, then the results of monitoring each week as inputs for carrying out summative evaluations.

Monitoring for the trial was carried out for three months to determine the level of validity and effectiveness of the media that had been developed to be used in the learning process. Monitoring of learning activities is seen from the activity record each week individually or in groups. The results of the evaluation in the first week will be input as improvement and improvement of the learning process in the second week, and so on.

The data obtained as a whole shows that students have used all the features provided such as courses as space to study material and download assignments for each topic, forum features as discussion rooms for each study group with the teacher, meeting /discussion/chat features are virtual meetings on the online path and provide task collection features.

Some of these facilities are standard features that are required to be used by students. In addition to the standard facilities, there are also optional facilities in the form of e-learning usage guidelines provided by teachers and students in the form of usage guidelines in print format and digital format uploaded on the web.

The results of recording learning activities have class characteristics that are quite good; the average activity of students always increases every week. They have read the material, discussed, and worked on the exercises in the competency test until the collection of tasks can be done on time. The following is the result of student activity recordings during learning.

**Table 1.** Student access to first week web facilities

Facilities	Total of users	Total of access
Material document	12	18
Activities/assignments	10	13
Discussion forum	7	11
Online consultation	6	6
Competence test	10	10

**Table 2.** Student Access to Web Facilities in the Second Week

Facilities	Total of users	Total of access
Material document	29	32
Activities/assignments	21	30
Discussion forum	25	29
Online consultation	14	19
Competence test	29	29

The development of access every week has always increased, the first week has shown pretty good results even though not all students access. Likewise, the following week, the number of accesses always increases.

This media development focuses on the activeness of students in carrying out the tasks given by the teacher. The task given to students is to study the material in each chapter thoroughly. In each chapter, some indicators show the percentage directly that can be obtained after completing studying the material. The percentage of completeness from the range of 0-100%, if students have not reached 100%

in learning the content cannot be said to be complete.

To find out the results of the learning process using e-learning, an assessment of the learning outcomes of students is held every week. The average achievement of learning outcomes is 81.7% for three weeks; this percentage shows that students have achieved the minimum completeness criteria.

## Conclusion

The development of e-learning is based on the fact that there are obstacles in the implementation of the learning process. These constraints are related to the problems of time, space, media, limited learning resources, and have not been able to meet the needs of learning activities, as well as the psychological constraints in students.

E-learning developed has undergone improvements through several stages of review of expert material experts, media experts and the results of trials on students. The results of the study indicate that e-learning developed has been valid and feasible to be used as a supplementary learning resource for students.

Learning outcomes through activities in online classrooms show that the average student has achieved minimal learning completeness, the standard of which has been determined by the school.

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